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PLATE 1213. Aerial photograph of east-central portion of Sanibel Island, showing vegetational features.

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JOURNAL OF

THE NEW ENGLAND BOTANICAL CLUB

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THE VEGETATION OF SANIBEL ISLAND LEE COUNTY, FLORIDA

George R. Cooley

Introduction

Sanibel Island lies in the Gulf of Mexico, a few miles off the southwestern coast of peninsular Florida near the mouth of the Caloosahatchee River about fifteen miles from the city of Fort Myers. Lying as it does, less than three degrees north of the Tropic of Cancer, Sanibel Island has many characteristics of tropical and sub-tropical insular areas. Furthermore, being only a few miles from the mainland, the island has the appearance of many sections of South Florida. Yet it is not exactly the same as any region of the tropics or of Florida, historically, geographically, geologically, or botanically. Occupied by white people for little more than seventy years, influenced by rivers, ocean currents, and mighty storms; made up almost entirely of shells and shell material; and the home of plants of the tropical, sub-tropical, and temperate zones, it is unlike, in many respects, any area to be found in the southern United States.

History of Sanibel

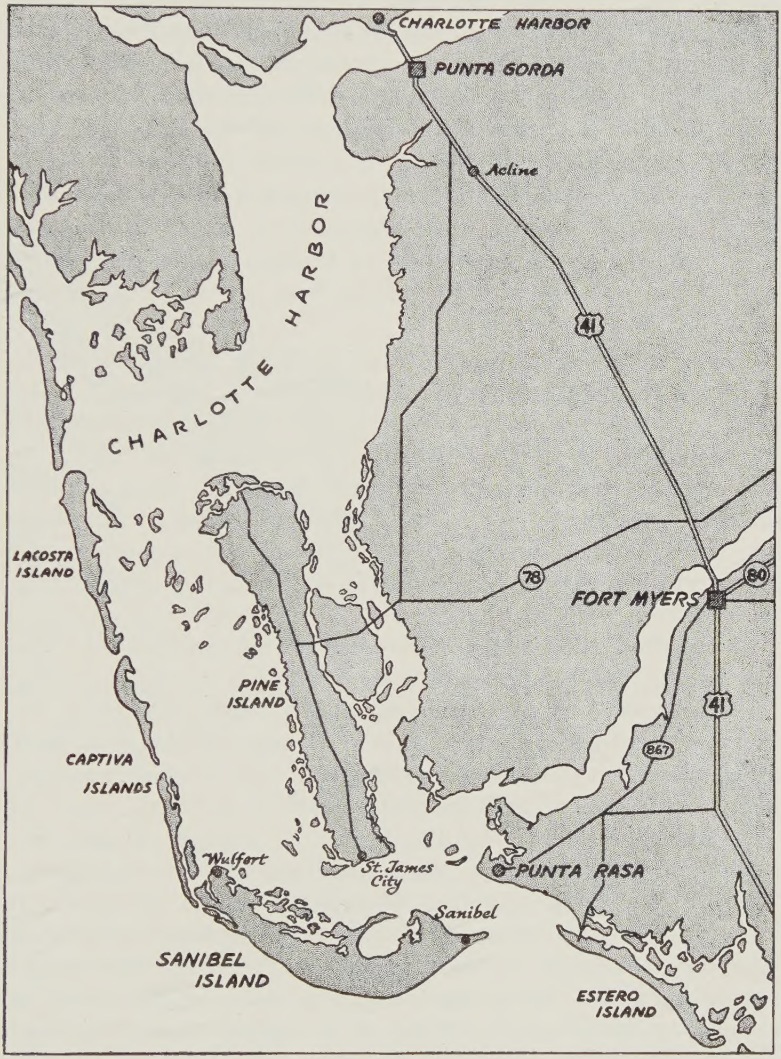
It is said that on his trip to the Gulf of Mexico and Mississippi River in 1539, De Soto stopped at Sanibel Island. Captain Bernard Romans, "Draugh^{m} Mathem^{n} Navigat^{r}" and "Naturalist & Botanist" in 1774, when describing the region around Charlotte Harbour north of Sanibel, said, "This nook in the land forms what the Spaniards call *Ensenada de Carlos*, i.e. Charle's Bay: the piece of coast that trends E. and W. is the beach of an island called Sanybel, This place is further remarkable

for a great number of pine-trees without tops, standing at the bottom of the Bay, like which there is no spot in the whole extent of this coast. The northernmost entrance is likewise remarkable for a singular hummock, or grove of pine-trees, standing very near the beach, and the only one of its form and kind in all these parts." No other records seem to be extant which would help us in an understanding of the flora of this island before its discovery by the white man four hundred years ago, or for that matter at any time up to the present.

At the time of De Soto's exploration and for three hundred years thereafter a tribe of Muspah Indians apparently made their homes on Sanibel Island and nearby Captiva Island. Great kitchen middens, mostly shells, give evidence of long tenure by these Indians. Mr. Julien C. Yonge of the Library of Florida History found in early records that in 1831 a New York company set up a colonial development at the eastern end of the island; there were also comments of a traveler to the effect that two years thereafter no evidence of this development remained except the framework of the largest house. About 1883 an agricultural and horticultural development started which was to change the face of the island for a period of over forty years. All the arable land on the island was cleared and cultivated (Map C). Citrus fruits and garden vegetables, principally tomatoes, eggplants, and squashes, were raised in considerable quantities. Boats came from the terminus of the railroad on the mainland a score of miles to the north to collect the produce. It is reported that one gardener in 1901 received $1,100 for the tomatoes grown on one acre of ground. In time, competition from the mainland lessened the prosperity of Sanibel farmers so that when a disastrous hurricane struck the island in 1926, half the population left. Those who remained have served winter visitors, fishermen, and shell collectors, for Sanibel has become known as one of the three great shell collecting beaches of the world. The replacement vegetation of the previously cultivated land is now again steadily progressing toward a climax.

Geography

All of the islands off the west coast of Florida lie north and south like reefs along the shoreline of the peninsula except



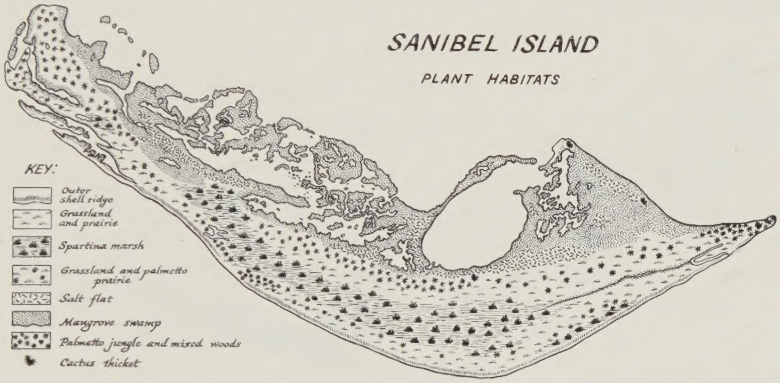
Map A. The Charlotte Harbor area of southwestern Florida, showing the location of Sanibel Island

Sanibel which lies east and west, at right angles to the others, taking the full brunt of storms from the south and being subjected to the constant flow of a northward moving gulf stream. The island is about 10.75 statute miles long and 2.6 statute miles across at its widest point; it lies at 26° 30′ N. latitude and 82° 10° W. longitude (Map A.)

Nowhere is the land more than fourteen feet above the level of the Gulf of Mexico. The elevation of most marsh areas is six feet or less; the grasslands, six to eight feet, and the hammocks and former cultivated areas from six to fourteen feet above sea level.

From the aerial photograph (Plate 1214, fig. 2) one can obtain a general idea of the geographical features and vegetation of the island. At the rounded point to the east is a 70-foot lighthouse; west of it can be seen a road bordered by casuarina trees. At this point there is the ferry landing, a restaurant, the post office and the home of the postmistress. On both sides of this road, which crosses the narrow end of the island, can be seen cleared areas representing an incipient real estate development. The dark space toward the lighthouse is a rather dense button mangrove thicket; the black spots represent red mangroves. The rest of the dense growth consists of button mangrove (*Conocarpus erecta*) and its associates, with a cactus thicket at the side toward the lighthouse. In the photograph the dark mass in the upper left indicates the presence of red mangrove swamps, which form matted growths along most of the inner shore on Pine Island Sound. The lighter-colored sweeps of gray are button mangrove swamps where airplants grow in abundance. A road extends east and west through the middle of the island. This is now a well-maintained macadam highway connecting by a concrete bridge at the west end of the island with neighboring Captiva. Along this road can again be seen rows of casuarinas planted about 1912 to 1914. South of the main road the grasslands are extensive, changing into *Spartina* marshes where the land is lower between the ancient shell ridges. Over the part of the island not shown the *Spartina* marshes are very much larger, being fully one-half mile in breadth and far-reaching in extent. A natural drainage area is shown by the irregular dark line through the center of the grasslands. The

straight white line indicates the road leading to the island's only general store and a community of winter dwellings. From this road toward the west, on the north side of the main highway, one can see formerly cultivated fields. A large part of the land on both sides of the main road from this section across the entire island is where the farming of the 1883–1928 period was done. The design at the lower left shows a winter resort. There are



Map B. The principal habitats and vegetational groupings on Sanibel Island.

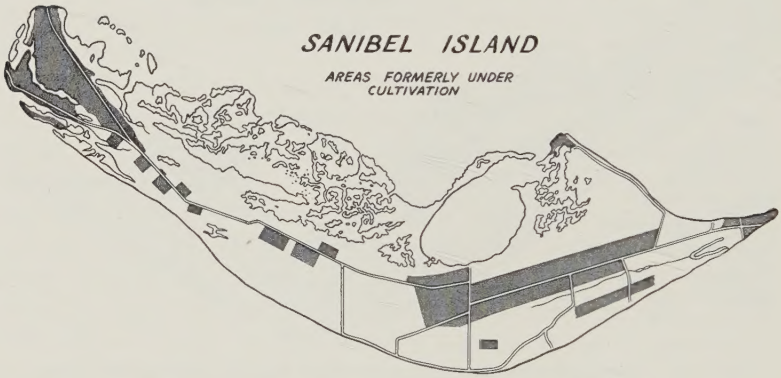
four such regions on the Gulf side of the island. Plate 1213 is an aerial photograph of the east central portion of the island. It shows vegetational features similar to those described above.

Ecological Features

The beach on the Gulf side ends abruptly at a ridge of shells washed up by a previous great storm. The island, other than the mangrove swamps and inner salt marshes, is made up of ridges more or less parallel to the Gulf shore. In ages past these ridges were formed in the same way as the present outer ridge which was created by the storm of October, 1953. Great quantities of shells were washed up onto the beach and over the beach-strand vegetation, burying all but the tallest of the shrubs and trees (Plate 1214, Fig. 1). Four and five feet of shells covered the strand for varying widths of fifty to one hundred-fifty feet forming a new ridge. Back of the new ridge is a marsh of *Spartina* and its associates growing up through broken shells. Successive ridges and low places produce prairie growths and

marsh vegetation, then transition vegetation and hammocks as the distance lengthens from the beach (Map B).

The inner north shore facing the quiet waters of Pine Island Sound is free from the effects of waves and storms and the vegetation consists of a great mangrove swamp. Back of the mangroves are tidal marshes, back of these on slightly higher ground are button mangroves bordering on hammocks and mixed woods as the elevation increases.



Map C. Former cultivated areas of Sanibel Island.

Among the red mangroves organic muck has formed to the depth of several feet; in the *Spartina* marshes a foot or more of humus has accumulated; but all other soils are made up of decomposing shell material and varying amounts of decaying vegetable matter.

Evidence of human occupation and disturbance in the form of ditches old and new, abandoned homesites, fence-rows, and former groves, give character to much of the higher ground. (See Map C showing formerly cultivated land, as defined by an old resident.)

Research discloses meager records of the flora of Sanibel and few specimens indeed are in herbaria of America. Botanists have neglected this interesting place. At the suggestion of Dr. Richard A. Howard the writer was prompted to undertake a floristic study of Sanibel and to that end made a winter's stay on the island and two subsequent visits to it.

A. S. Hitchcock visited Sanibel in 1900, and three specimens collected by him at that time have now been located at the Gray Herbarium. He was probably the instigator of S. M. Tracy's trip to Sanibel in 1901, when the new species *Eragrostis tracyi* Hitchcock was collected, but no notes and only few specimens of this trip can now be found. George A. Orric collected on neighboring Captiva Island in 1915, but it is not known that he made any study of Sanibel. On January 24, 1924 Roland M. Harper spent a few hours on the island and, as stated in a letter to the author, "took what notes I could on the vegetation, and a few pictures, but do not think I collected any plants." James B. McFarlin did some collecting on Sanibel November 4, 1934, incidental to his study of the flora of Polk County, central Florida. In 1936, J. R. Swallen collected five grasses; and in 1951, R. Bruce Ledin spent two days on Sanibel collecting 52 numbers for the Buswell Herbarium at the University of Miami. Ledin collected plants of Sanibel that were typical of the Florida Keys of Monroe County. He was amazed at the number of identical species found in both places. About 35 of 52 species collected were considered to be essentially West Indian plants. Specimens in the herbarium of the University of Florida (from Sanibel) are probably less than a dozen, according to Miss Lillian E. Arnold, Curator. John H. Davis and the writer spent a day on Sanibel in 1951, but did little collecting.

Of all these visits few comments remain for our understanding of the flora of Sanibel. In 1927 in "Natural Resources of South Florida" Harper said of the West Coast islands, "the vegetation comprises that of beaches and dunes, cactus thickets, salt flats, palm savannas, mangrove swamps, and a little tropical hammock. There is a little truck-farming on some of the islands, such as Sanibel."

This study purports to provide a general understanding of the ecology of the Island and its present vegetation to the end that comparisons in the future may be accurately made.

Vegetational Features

Even the casual visitor to Sanibel is impressed by the number and ubiquity of the cabbage palm (*Sabal palmetto*). Throughout the island it is found in almost all habitats, giving its name to

some, as cabbage palm prairie (Plate 1215, Fig. 3) to the grasslands, and cabbage palm jungle to the hammocks. A quarter of a mile from the ferry landing adjoining the oldest settlement area on the island is a stand of *Sabal palmetto* reminding one of a mature reforestation plantation so tall, so straight, and so dominant are the trees of this species.

Clinging to the cabbage palms and often growing rampant over them are *Rhus radicans* and less frequently *Parthenocissus quinquefolia*. Living on them epiphytically are *Ficus aurea*, *Vittaria lineata*, and *Phlebodium aureum* and that strange cryptogam of the sub-tropics, *Psilotum nudum*, with slender, branching, delicate stems is sometimes found at the base of the cabbage palms.

Another tree which is characteristic of the modern Sanibel landscape is the Australian pine (*Casuarina equisetifolia*) which lines many of the roads and beaches. Brought to the island about forty-five years ago, *Casuarina* has become well established. By the distribution of vast numbers of seeds it has extended its territory far beyond the roadsides and beach strands where it was originally planted. At one place in the center of the island it has multiplied to the point of forming a wood where it tends to become dominant. On Wulfert Road is a row of *Casuarina cunninghamiana* about 30 to 40 years old. This species is apparently not becoming naturalized.

From the main black-top road which extends through the center of the island for its entire length, mangroves are noticeable at only one point. However, a boat ride along the inner shore for almost the entire length of the island reveals a mangrove swamp of eight square miles. Dominant at the water's edge is the red mangrove (*Rhizophora mangle*), its interlacing and arching trunks, branches, and roots forming a maze through which progress can be made only with persistence and a sharp machete. Wherever the soil has been built up above the mean tide level, black mangroves (*Avicennia nitida*) appear with trunk diameters up to 4″ at breast height. Deeper in the swamp (hence rarely seen from a passing boat) and only where the soil is generally above the tide are the white mangroves (*Laguncularia racemosa*), attaining a size no greater than large shrubs.

Between the red mangrove swamps and the hammocks and cabbage palm savannas toward the middle of the island are

interesting belts of button mangroves (*Conocarpus erecta*, Plate 1215, Fig. 4). Here flourish air plants in some profusion; not much Spanish moss (*Tillandsia usneoides*) but an abundance of *Epidendrum tampense*, *Tillandsia fasciculata*, *T. balbisiana*, *T. utriculata*, and *T. tenuifolia*. At four places cactus thickets have been formed among the button mangroves; wicked places for the botanist, but happy homes for gopher snakes which grow to lengths of seven and eight feet.

As the button mangroves become numerous, extending toward the center of the island (Plate 1216, Fig. 6), they are joined by an interesting transition group of a score or more of hammock trees and shrubs, including the following:

Ardisia escallonioides
Baccharis glomeruliflora
Chiococca alba
Dodonaea jamaicensis
Eugenia anthera
Eugenia myrtoides
Eugenia axillaris
Forestiera porulosa
Jacquinia keyensis
Pithecellobium unguis-cati
Randia aculeata
Phytolacca rigida
Rivina humilis
Zanthoxylum fagara
Capparis cynophallophora
Rapanea guianensis
Sideroxylon foetidissimum
Bumelia angustifolia
Psychotria nervosa

On the larger of these trees, Spanish moss grows more abundantly than other air plants. Cabbage palms are present, acting as hosts to the shoestring fern (*Vittaria lineata*), the golden polypody (*Phlebodium aureum*), and young growths of the strangling fig (*Ficus aurea*) (Plate 1216, Fig. 5). They also support a vigorous growth of poison ivy (*Rhus radicans*) and Virginia creeper (*Parthenocissus quinquefolia*).

The writer should mention here Sanibel's second worst pest (mosquitoes are first), poison ivy. Apparently it will not tolerate salt water and is therefore not found in the mangrove swamps or the salt marshes. The beaches and the black-top road do not provide happy homes for *Rhus radicans* either, but every other habitat is congenial to it. On a cabbage palm was found a poison ivy plant with a stem 9 cm. in diameter at breast height. One branch 13 dm. long bore 6,130 blossoms. Often leaves are found 10 cm. wide and 20 cm. long. On the cabbage palms some poison ivy plants grow 10 meters high. In a cabbage palm thicket six hundred seventy-two poison ivy plants or sprouts were counted in a quadrat twenty by twenty feet.

In the buttonwood swamps and the hammocks and near Indian shell mounds has grown the tree cotton (*Gossypium hirsutum*). For a long time, despite the fact that commercial cotton is not raised within two or three hundred miles of Sanibel, the Department of Agriculture has sent four men to the island several times a year to rid it of wild cotton and thus deprive the boll weevil of food and a breeding place. The species has persisted but is now almost extinct on Sanibel as only three young plants were found in a two-day search in February (1954).

Hammocks on Sanibel vary greatly. As indicated above, one hammock is a stand of pure *Sabal palmetto;* many are *Sabal palmetto* jungles where trees, shrubs, vines and herbs compete; some in the center of the island are distinguished by *Quercus virginiana;* and some are mixed forests. The gumbo limbo tree (*Bursera simaruba*), although frequent and widespread through the higher elevations of the island, is nowhere abundant. Because of its red bark it is often mistakenly called mahogany by natives and visitors alike. In a mixed wood on Wulfert Road stands a slash pine (*Pinus elliottii* var. *densa*) with several younger trees near by. Millions of slash pines grow on the mainland and yet Sanibel can boast of but one small colony.

Several square miles of *Spartina* marshes lie between the principal hammocks and the coastal shell ridge. Here the dominant is *Spartina bakeri*, accompanied by *Cladium jamaicense, Andropogon glomeratus, Bacopa monnieri*, and *Sesuvium portulacastrum* (Plate 1217, Fig. 7). In the marshes the presence of ancient shell ridges is evidenced by plants which prefer slightly drier ground. Luxuriant growths appear of *Baccharis halimifolia, Sporobolus domingensis, Aristida patula, Fimbristylis castanea, Flaveria linearis, Kosteletzkya virginica, Mikania batatifolia, Rhus radicans, Melothria pendula, Melanthera deltoides*, and on still higher ground *Sabal palmetto* and its prairie associates (Plate 1217, Fig. 8).

The grass lands between the coastal shell ridge and the *Spartina* marshes are largely dry open areas in which the following species grow:

Bouteloua hirsuta
Sporobolus virginicus
Aristida patula
Chloris petraea
Piriqueta caroliniana
Pluchea purpurascens
Rhynchosia michauxii
Samolus ebracteatus

Bidens pilosa
Cirsium horridulum
Coreopsis leavenworthii
Flaveria floridana
Flaveria linearis
Gaura angustifolia
Opuntia austrina
Physalis elliottii
Sida carpinifolia
Waltheria americana
Conyza canadensis
Vigna repens
Lochnera rosea
Crotalaria striata
Cassytha filiformis
Cenchrus pauciflorus

The shrubby areas also present are composed of:

Forestiera porulosa
Baccharis halimifolia
Myrica cerifera
Ernodea littoralis
Eugenia axillaris
Jacquinia keyensis
Lantana involucrata
Lantana ovatifolia
Sophora tomentosa
Trichostema suffrutescens
Capraria biflora

Charles Torrey Simpson said "To the naturalist . . . the seashore is the most fascinating place in the world."[1] On Sanibel's seashore the coastal shell ridge—a pile of countless shells—influences the botanist by some powerful and irresistible charm. To be sure, the hand of man has contributed to the flora of the coastal ridge by his plantings of *Casuarina equisetifolia* to bind the soil and break the wind, but the hand of nature has brought to the beach strand other plants entrancing in their characteristics and different in their forms and habits.

Coccoloba uvifera, the sea grape, changes in appearance many times a year. Its shiny, bright new leaves in March replace the dull "platter" leaves which fall to cover the earth beneath; then 15 cm. spikes of greenish yellow flowers extending from the axils of pairs of near-opposite leaves attract the bees and insects; clusters of large fruit of deepening color tempt the local housewives to make sea-grape jelly; then the aging leaves grow dull again and await the rebirth of another spring.

A pan-tropical half-shrub, *Scaevola plumieri* (Fig. 9) tolerates the salt spray and saline soil of the upper beach. Its succulent leaves retain a full green color throughout the year; its springtime white flowers have five white involute petals arranged palmately in a plane.

The active waters of the beach give *Rhizophora mangle* no chance for a footing, and the dry character of the ridge excludes *Avicennia nitida* and *Laguncularia racemosa*. *Conocarpus erecta*,

[1] "In lower Florida wilds," page 276. New York. 1920.

the button mangrove, has more success along the coastal shell ridge, generally near the marshes or in man-made ditches (Plate 1218, Fig. 10). The cinereous form of *Conocarpus erecta* grows at four stations, none of them near the coast. On the neighboring island of Captiva *Ambrosia hispida* forms runners exceeding fifty feet, but on Sanibel the plant is rare and small. Another soil-binder, however, is by no means so rare; *Ipomoea pes-caprae*, the railroad vine, climbs over both the ground and the vegetation.

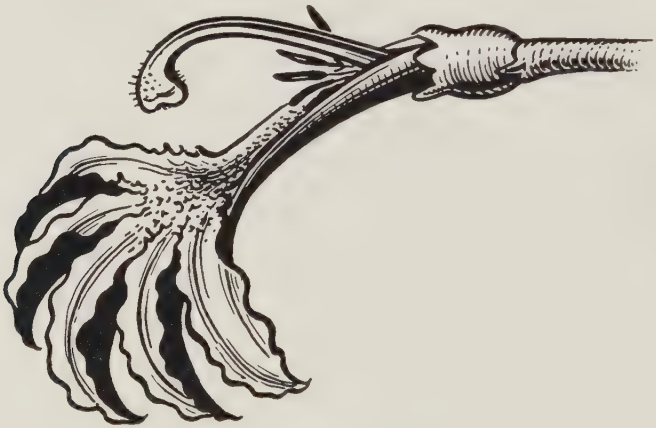


Fig. 9. Flower of *Scaevola plumieri*, × 4.

Most abundant of the shrubby growths of the coastal shell ridge is *Suriana maritima*, the bay cedar, in the West Indies often called tassel plant, with small yellow flowers and alternate entire leaves. With it are scattered plants of *Uniola paniculata* with culms two meters in height. These sea oats serve to bind the coastal soil but are never dominant on Sanibel.

I collected what appeared to be two species of *Oenothera* occur on the beach, one with yellow flowers and one with reddish flowers. Both are *Oenothera humifusa*, whose flowers are yellow when new blown and reddish when older, the change taking place even from morning to afternoon.

The creeping plants of the marshes, *Sesuvium*, *Portulaca*, and the salt-tolerant grasses of the wet areas are not found on the coastal ridge, for it is a dry habitat where rain filters quickly

through the crushed shell aggregate. It is to be expected that *Calonyction* should clamber over the shrubs of the coastal shell ridge, but *Calonyction tuba* grows only on the low ridge at the inner side of the island where storms are not severe and *Calonyction aculeata* lives mostly one hundred fifty yards and more back from the gulf beach.

Common on the coastal ridge is *Baccharis halimifolia* and less frequent is *Baccharis dioica*. The ordinarily entire leaves of the latter are here sometimes indented, possibly from hybridization. It has the distinctive habit of extending its tap root horizontally just beneath the ground at right angles to its stem.

From one end of the island to the other on twelve miles of outer shell ridge many native, adventive, and waif species make their homes. *Solidago sempervirens* var. *mexicana* is present but not abundant. *Bidens pilosa*, with its bright yellow-centered flower heads, is much more abundant, and its barbed achenes, known as Spanish needles, cling tenaciously to everyone who brushes past the plant. Mention should be made of the chaff flower (*Achyranthes ramosissima*). This tropical herb of the amaranth family has a spreading manner of growth among the herbs and low shrubs. *Cakile* (Plate 1221, Fig. 17) is widespread through the sub-tropics, but only one species of it (*Cakile fusiformis*) is found on Sanibel and at only one spot on disturbed ground near a real estate development.

There is only one extensive broad beach area (Plate 1219, Fig. 13), and that toward the western end of the island. This beach is up to two hundred yards wide, and is composed of both quartz sand and shell fragments, but unlike typical sandy beaches drifts little. Such vegetation as manages to exist in the broiling sun and salt air includes *Sesuvium portulacastrum* (Plate 1219, Fig. 12), *Suriana maritima* (Plate 1220, Fig. 14), *Scaevola plumieri*, *Euphorbia buxifolia*, *Oenothera humifusa*, *Iva imbricata*, *Atriplex arenaria*, *Uniola paniculata*, *Sporobolus virginicus*, *Spartina patens*, and *Ipomoea pes-caprae*. The rolling beach grades downward into marshes with a varied border of *Dalbergia ecastophyllum*, *Coccoloba uvifera*, *Suriana maritima*, *Conocarpus erecta*, *Casuarina equisetifolia*, and other shrubs.

The white panicles of *Yucca aloifolia* do not last long but for a short time offer a spectacle to those "shellers" whose eyes are

raised from the beach. No other *Yucca* grows on Sanibel. *Chloris petraea, Lochnera rosea, Rhus radicans, Cenchrus pauciflorus, Sporobolus virginicus, Euphorbia* spp., *Heliotropium parviflorum, H. polyphyllum, H. curassavicum, Conyza canadensis,* and *Asclepias verticillata* are a few of the vascular plants crowding the slopes and crest of the coastal shell ridge.

Eragrostis tracyi was described as a new species from a collection made on Sanibel in May, 1901. It was not collected again on Sanibel until April 13, 1954, but has never been found elsewhere. It is common on disturbed ground, roadsides, lawns, around homes, and in cleared areas. Diligent search over grasslands and savannas produced no plants. The habitat it occupies leads one to believe that *Eragrostis tracyi* has been introduced onto Sanibel. But from where did it come?

Check List

Nomenclature provides a problem for the taxonomists of the Southern States. No manual exists to which a botanist can go for names of southern plants in keeping with recent taxonomic studies and judgment, and in conformity with the International Code of Nomenclature. The author searched the monographs and writings of the last twenty years and has used the names which in large part conform to the best present-day usage.

Mr. Jason R. Swallen, of the United States National Museum, identified the grasses collected, and Professor Erdman West and Miss Lillian E. Arnold of the University of Florida helped with the determination of all other specimens. Specimens have been deposited in the United States National Museum, the Gray Herbarium, the herbarium of the New York Botanical Garden, the herbarium of the University of Florida, and the Cooley Herbarium of Rensselaerville, New York.

In the check list which follows seven habitat columns are used after Lemon (ms). The column headed Mangrove Swamps for convenience includes red mangrove swamp plants; *Spartina* Marshes include salt marsh plants; and Grasslands and Savannas combine both wet and dry areas. Frequent ancient shell ridges throughout the island increase the elevation slightly at many points, providing congenial habitats for plants of dry preference in the midst of damp and wet areas. No effort has

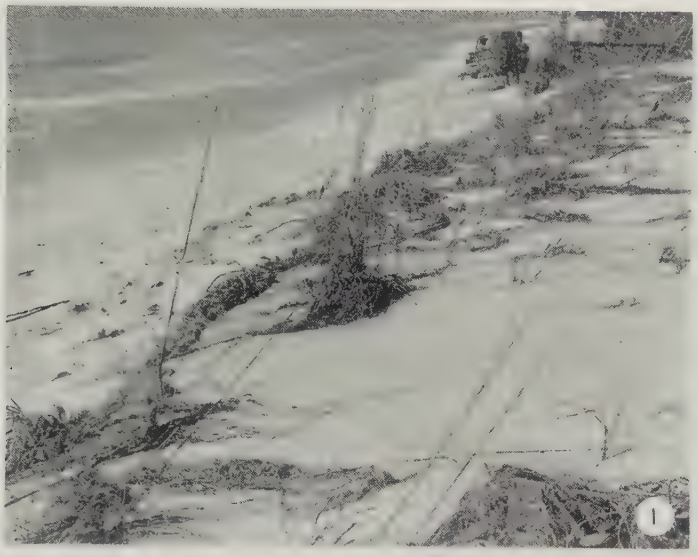
been made to define these habitats precisely; rather general ecological names have been used.

DEFINITIONS

Dominant (D) Prevailing, tending to drive out all other plants and to resist invasion by them.
Abundant (A) Teeming, in copious supply.
Common (C) General, not local, so frequent as to be found easily.
Frequent (F) Often to be met with, but not general.
Infrequent (I) Isolated, sparse, occurring at considerable distances.
Rare (R) Seldom met with, so infrequent as to be unexpected.

	Old fields	Coastal shell ridge	Spartina marshes	Grasslands & savannas	Mangrove swamps	Palmetto jungles	Mixed woods
Chara zeylanica Klein in Willd.			I				
Psilotum nudum L.						I	I
Acrostichum danaeaefolium Langsd. & Fisch.			A				
Blechnum serrulatum Rich.	F					F	F
Nephrolepis exaltata (L.) Schott	I					I	
Phlebodium aureum L.						C	F
Polypodium polypodioides (L.) Watt							R
Pteridium aquilinum (L.) Kuhn, var. caudatum (L.) Sadebeck	I						
Pteridium aquilinum (L) Kuhn, var. pseudo-caudatum (Clute) Heller	I						
Vittaria lineata Sw.						F	F
Typha angustifolia L.			I				
Typha domingensis Pers.			F				
Pinus elliottii Engelm., var. densa Little & Dorm.							I
Najas guadalupensis (Spreng.) Morong			I				
Andropogon glomeratus (Walt.) BSP.	F		I	F			
Andropogon virginicus L.		F					
Aristida patula Chapm. ex Nash				F			
Aristida purpurascens Poir.				I			
Bouteloua hirsuta Lag.				A			
Cenchrus echinatus L.	F	F		I			
Cenchrus incertus M. A. Curtis	C	I					
Cenchrus pauciflorus Benth.	C	C		F			
Chloris petraea Swartz	C	C		C			
Cladium jamaicense Crantz			C				
Cynodon dactylon (L.) Pers.		I	C				
Dactyloctenium aegyptium (L.) Beauv.	I						
Digitaria sanguinalis (L.) Scop.	F						
Distichlis spicata (L.) Greene			C				
Eleusine indica (L.) Gaertn.	C	F					
Eragrostis ciliaris (L.) R. Br.						I	
Eragrostis elliottii S. Wats.	I						
Eragrostis pilosa (L.) Beauv.	I						
Eragrostis tracyi Hitchc.	C						
Leptochloa dubia (H. B. K.) Nees.	C	F		C			
Muhlenbergia capillaris (Lam.) Trin.				F			
Panicum adspersum Trin.	F						

	Old fields	Coastal shell ridge	Spartina marshes	Grasslands & savannas	Mangrove swamps	Palmetto jungles	Mixed woods
Panicum agrostoides Spreng.		F					
Panicum albomarginatum Nash	F						
Panicum amarulum Hitchc. and Chase		F					
Panicum bartowense Scribn. & Merr.	F						
Panicum dichotomiflorum Michx.	C						
Panicum neuranthum Griseb.	F			F			
Panicum virgatum L.				F			
Paspalum ciliatifolium Michx.	I			I			
Paspalum vaginatum Swartz		F		F			
Pennisetum glaucum (L.) R. Br.	I						
Rhynchelytrum roseum (Nees) S. & H.	C						
Setaria geniculata (Lam.) Beauv.	F	F	C				
Setaria glauca (L.) Beauv.	F			F			
Setaria macrosperma (Scribn. & Merr.) Schum.	I						
Sorgum halepense (L.) Pers.	I						
Spartina bakeri Merr.			D	I			
Spartina patens (Ait.) Muhl.		F					
Sporobolus domingensis (Trin.) Kunth		C					
Sporobolus juncea (Michx.) Kunth		I					
Sporobolus virginicus (L.) Kunth		A					
Triplasis purpurea (Walt.) Chapm.	R	I					
Uniola paniculata L.		C		I			
Cyperus globulosus Aubl.	I			I			
Cyperus ligularis L.	C	F		F			
Cyperus martindalei Britton	I						
Cyperus planifolius L. C. Rich.		I	F	C			
Cyperus polystachyos Rottb., var. texensis (Torr.) Fern.	F		C	I			
Cyperus pseudovegetus L.	I						
Cyperus rotundus L.	I						
Cyperus strigosus L.			I				
Dichromena colorata (L.) Hitchc.	C			C			
Eleocharis atropurpurea (Retz.) Kunth	C						
Eleocharis geniculata (L.) R. & S.			F				
Fimbristylis castanea (Michx.) Vahl	C			C			
Scirpus americanus Pers.			F				
Scirpus cyperinus (L.) Kunth, var. eriophorum Michx.				I			
Cocos nucifera L.	F	I					
Sabal palmetto (Walt.) Torr.	C	F		F		D	F
Serenoa repens (Bartr.) Small				D		F	
Lachnocaulon anceps (Walt.) Morong			R				
Tillandsia balbisiana Schult.					C		
Tillandsia circinata Schlech.					I		
Tillandsia fasciculata Sw.					C		
Tillandsia recurvata L.	I				I		I
Tillandsia tenuifolia L.					C		
Tillandsia usneoides L.					F		
Tillandsia utriculata L.					C		
Commelina erecta L.	F						
Juncus megacephalus M. A. Curtis				I			
Sansevieria guineensis Willd.	Escape						
Smilax auriculata Walt.						F	F



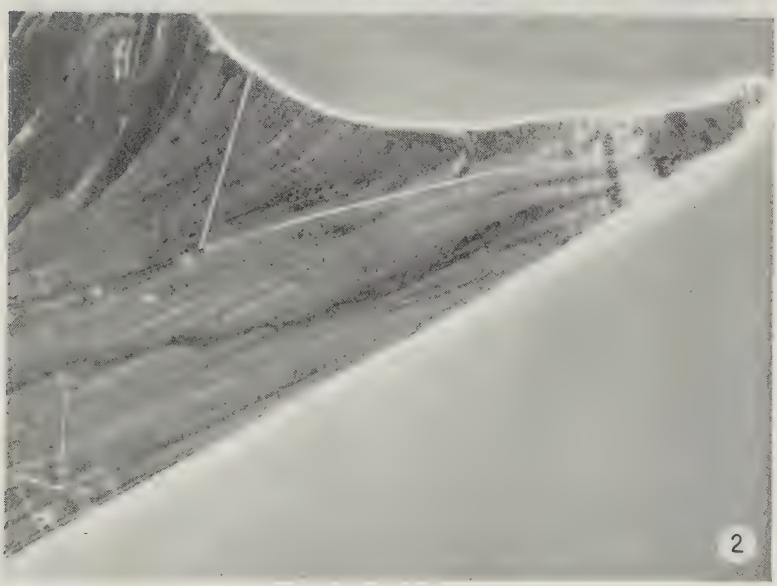


PLATE 1214. FIG. 1, Recently formed shell ridge. FIG. 2, Aerial photograph showing ancient shell ridges paralleling the south coast.

PLATE 1215. FIG. 3, Sanibel's most abundant tree, *Sabal palmetto*. FIG. 4, Adjacent communities of *Spartina* and *Conocarpus*.

PLATE 1216. FIG. 5, Strangling fig around cabbage palm at edge of mixed woods. FIG. 6, Typical button mangrove thicket, with *Tillandsia* in center.

PLATE 1217. FIG. 7, *Bacopa monnieri* dominant in low places of *Spartina* marshes. FIG. 8, *Spartina* marsh, showing cabbage palm "islands," on the slightly higher ground of ancient shell ridges.

PLATE 1218. FIG. 10, Thicket with *Conocarpus*, *Sabal*, and *Yucca* in transition zone between grassland and *Conocarpus* swamps. FIG. 11, Gumbo limbo at edge of Palmetto jungle.

PLATE 1219. FIG. 12, *Sesuvium portulacastrum* dominant on a low beach area with straggling *Conocarpus* in the background. FIG. 13, The broad beach at the western end of the island.

PLATE 1220. FIG. 14, The stretch of broad beach at the western end of the island, showing *Suriana maritima* and *Uniola paniculata*. FIG. 15, *Agave sisalana* persisting in an old field, after cultivation.

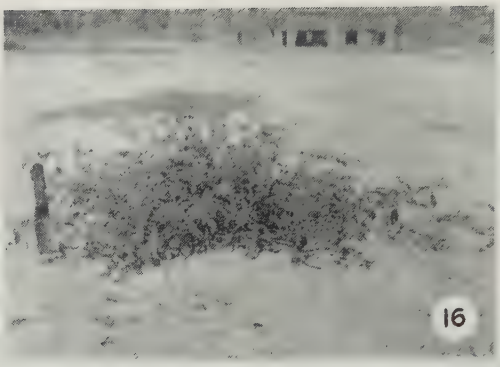


PLATE 1221. FIG. 16, *Solanum gracile*, a common weed of disturbed areas. FIG. 17, *Cakile fusiformis*, the only species of this genus found on Sanibel. FIG. 18, *Borrichia frutescens* dominating a salt marsh, with buttonwood in background.

	Old fields	Coastal shell ridge	Spartina marshes	Grasslands & savannas	Mangrove swamps	Palmetto jungles	Mixed woods
Yucca aloifolia L.	I	C					
Agave americana L.	I						
Agave decipiens Baker	I				I		
Agave sisalana Perrine	F						
Hymenocallis keyensis Small		!					
Sisyrinchium atlanticum Bickn.	F		F				
Epidendrum tampense Lindl.					F		
Zeuxine strateumatica (L.) Schltr.				I		I	
Casuarina cunninghamiana Miq.	R						
Casuarina equisetifolia Forst.	A	A		I			I
Salix longipes Anders.			I				
Myrica cerifera L.	F			F		C	C
Batis maritima L.		I		I	F		
Quercus virginiana Mill.							F
Ficus aurea Nutt.	F			F		F	F
Parietaria nummularia Small	I						
Coccoloba uvifera (L.) Jacq.	C	C		I	F	I	I
Atriplex arenaria Nutt.		A					
Chenopodium album L.	C						
Chenopodium ambrosioides L., var. anthelminticum (L.) Gray	I						
Salicornia perennis Mill.			C				
Suaeda linearis (Ell.) Moq.			C				
Achyranthes ramosissima (Mart.) Standley	C	F	I	F		I	I
Amaranthus hybridus L.	F						
Froelichia floridana (Nutt.) Moq.		F					
Iresine celosia L.		C					
Philoxerus vermicularis (L.) R. Br.			C	C			
Boerhaavia paniculata L. C. Rich.	I	F		I			
Phytolacca americana L.	F	I				I	
Rivina humilis L.						I	F
Sesuvium maritimum (Walt.) BSP.		F					
Sesuvium portulacastrum L.		C					
Portulaca oleracea L.	F						
Portulaca phaeosperma Urban	C			C			
Portulaca pilosa L.	I	I					
Annona glabra L.		I			F		
Cassytha filiformis L.	F			F			
Argemone leiocarpa Greene	I						
Argemone mexicana L.	I						
Capparis cynophallophora L.					I		
Cakile fusiformis Greene		I					
Lepidium virginicum L.	C			I			
Chrysobalanus icaco L.						I	I
Chrysobalanus oblongifolius Michx.				F			
Abrus precatorius L.	I						
Acacia farnesiana (L.) Willd.	I						
Caesalpinia bonduc L.		I					I
Caesalpinia crista L.		I					
Canavalia obtusifolia DC.	I	F					
Cassia tora L.	I						
Centrosema virginianum (L.) Benth.	C	I		I			
Chamaecrista aspera (Muhl.) Greene	I			F			I

	Old fields	Coastal shell ridge	Spartina marshes	Grasslands & savannas	Mangrove swamps	Palmetto jungles	Mixed woods
Crotalaria incana L.							
Crotalaria linaria (Small) Fern. & Schub.	F						
Crotalaria rotundifolia (Walt.) Poiret	F						
Crotalaria striata DC.	F						
Dalbergia ecastophyllum (L.) Britt.		I					
Desmodium tortuosum (Sw.) DC.	F			I			
Erythrina herbacea (L.) Small						I	
Galactia parvifolia Rich.	F	F					
Galactia volubilis (L.) Britton		C					
Neptunia lutea (Leavenw.) Benth.	I						
Piscidia piscipula (L.) Sarg.					I		
Pithecellobium unguis-cati (L.) Benth.					I		I
Rhynchosia lewtonii (Vail) Small	I		F				
Rhynchosia michauxii Vail	I		F				
Rhynchosia minima (L.) DC.				I			
Sesbania macrocarpa Muhl.	I						
Sophora tomentosa L.		I				F	F
Tamarindus indica L.	F						
Vicia acutifolia Ell.	C						
Vigna repens (L.) Kuntze			F				
Oxalis dillenii Jacq.	F						
Zanthoxylum clava-herculis L.							I
Zanthoxylum fagara (L.) Sarg.					F	F	I
Suriana maritima L.		A					
Bursera simaruba (L.) Sarg.	F					I	F
Asemeia cumulicola Small	F						
Asemeia grandiflora (Walt.) Blake, var. leiodes Blake	F						
Polygala incarnata L.				F			
Cnidoscolus stimulosus (Michx.) Engelmann & Gray	F						
Croton floridanus Ferguson	I			I			
Euphorbia ammannioides H.B.K.		F					
Euphorbia buxifolia L.		C					
Euphorbia heterophylla L.	C						
Euphorbia hirta L.	C	I		I			
Euphorbia hyssopifolia L.	I			I			
Euphorbia maculata L.		F					
Euphorbia pilulifera L.	F						
Euphorbia trichotoma H.B.K.		F					
Phyllanthus abnormis Baill.				F			
Ricinus communis L.	F						
Stillingia aquatica Chapm.	I						
Stillingia sylvatica L.	I						
Rhus radicans L.	C	I	I	I	I	C	C
Schinus terebinthifolius Raddi			I				
Maytenus phyllanthoides Benth.						I	
Cardiospermum halicacabum L.					I		
Dodonaea jamaicensis DC.	I			I		F	
Parthenocissus quinquefolia (L.) Planch.						F	F
Gossypium hirsutum L.						I	
Kosteletzkya virginica (L.) Presl			F	I			
Kosteletzkya virginica (L.) Presl, var. althaeifolia (Chapm.) A. Gray					R		

	Old fields	Coastal shell ridge	Spartina marshes	Grasslands & savannas	Mangrove swamps	Palmetto jungles	Mixed woods
Sida carpinifolia L. f.	C			I			
Waltheria americana L.	F						
Piriqueta caroliniana (Walt.) Urban, var. glabra (DC.) Urban	C						
Carica papaya L.	I						
Mentzelia floridana Nutt.	F						
Acanthocereus floridanus Small					I		
Opuntia austrina Small	F	F		F			
Opuntia dillenii (Ker.) Haw.		F					
Opuntia ficus-indica (L.) Mill.	I						
Opuntia keyensis Britton	I						
Ammannia latifolia L.	F						
Lythrum lanceolatum Ell.					F		
Rhizophora mangle L.		I			D		
Conocarpus erecta L.	I	F		I	D		
Conocarpus erecta L., var. sericea Forst. ex DC.	I						
Laguncularia racemosa (L.) Gaertn.		I			C		
Eugenia anthera Small					I	F	F
Eugenia axillaris (Sw.) Willd.				I			
Eugenia buxifolia (Sw.) Willd.							I
Psidium guajava Raddi	F						
Gaura angustifolia Michx., var. eatonii (Small) Munz.	F	I		I			
Ludwigia microcarpa Michx.			I	I			
Oenothera humifusa Nutt.		C		I			
Oenothera laciniata Hill	I						
Eryngium baldwinii Spreng.				I			
Hydrocotyle umbellata L.			F				
Ptilimnium capillaceum (Michx.) Raf.							
Jacquinia keyensis Mez.	F						
Ardisia escallonioides S. & C.	F			F			
Rapanea guianensis Aubl.					I		F
Samolus ebracteatus H.B.K.			C		I		
Samolus floribundus H.B.K.				I			
Bumelia angustifolia Nutt.	C				I		
Sideroxylon foetidissimum Jacq.							I
Forestiera porulosa (Michx.) Poir.	F	I					F
Ligustrum ovalifolium Hassk.	I						
Cynoctonum mitreola (L.) Britton				I			
Polypremum procumbens L.	C						
Eustoma exaltatum (L.) Griseb.					I		
Sabatia campanulata (L.) Torr.	C			F			
Lochnera rosea (L.) Reichenb.	C			C			
Rhabdadenia biflora (Jacq.) Muell-Arg.					I		
Urechites lutea (L.) Britton					I		
Asclepias verticillata L.	I	F					
Cryptostegia grandiflora R. Br.	I						
Cynanchum palustre (Pursh) Heller	C						
Cynanchum scoparium Nutt.	I						
Sarcostemma clausum (Jacq.) R. Br.							
Calonyction aculeatum (L.) House	F	I	F				
Calonyction tuba (Schlecht.) Colla		I					
Cuscuta campestris Yuncker		I					

	Old fields	Coastal shell ridge	Spartina marshes	Grasslands & savannas	Mangrove swamps	Palmetto jungles	Mixed woods
Ipomoea cathartica Poir.					F	I	
Ipomoea pes-caprae (L.) Sweet		C					
Ipomoea sagittata Cav.			I				
Heliotropium curassavicum L.		I					
Heliotropium parviflorum L.		I					
Heliotropium polyphyllum Lehm.		F					
Avicennia nitida Jacq.		I			C		
Lantana camara L.	C			C		I	
Lantana involucrata L.	C	I					
Lantana ovatifolia L.	F						
Lippia nodiflora L.	C		F	F			
Verbena scabra Vahl							
Trichostema suffrutescens Kearn.	F						
Physalis elliottii Kunze	C	F		C			
Physalis pubescens L.	R						
Solanum gracile Link.	C			F			
Bacopa monnieri (L.) Pennell			C				
Buchnera floridana Gandoger	F			F			
Capraria biflora L.	C			F			
Ernodia littoralis Sw.				C	C		
Gerardia maritima Raf.				F			
Scoparia dulcis L.	I						
Dicliptera assurgens Juss.							
Thunbergia fragrans Roxb.	I					I	
Chiococca alba (L.) A. Hitchc.	F					I	I
Chiococca pinetorum Britton							I
Galium hispidulum Michx.	F	F					
Galium tinctorium L., var. floridanum Wiegand	F						
Genipa clusiaefolia (Jacq.) Griseb.						I	C
Houstonia nigricans (Lam.) Fern.					C		
Houstonia procumbens (Walt.) Standley						R	
Psychotria undata Jacq.						F	F
Randia aculeata L.		I			F		
Sambucus simpsonii Rehder	I						
Melothria pendula L.			F	F			
Lobelia feayana A. Gray				F			
Scaevola plumieri Vahl		C		I			
Ambrosia artemisiifolia L., var. elatior (L.) Descourtils	C	I		F			
Ambrosia hispida Pursh		I					
Aster subulatus Michx.		I					
Baccharis angustifolia Michx.				F			
Baccharis dioica Vahl		I					
Baccharis glomerulifolia Pers.						I	
Baccharis halimifolia L.	C	C		F			
Berlandiera subacaulis Nutt.	I						
Bidens pilosa L., var. radiata Schultz-Bip.	C	C		C			
Borrichia frutescens (L.) DC.		I	A	F			
Cirsium horridulum Michx., forma elliottii (T. & G.) Fern.				C			
Conyza canadensis (L.) Britton, var. pusilla (Nutt.) Cronq.	C						

	Old fields	Coastal shell ridge	Spartina marshes	Grasslands & savannas	Mangrove swamps	Palmetto jungles	Mixed woods
Coreopsis leavenworthii T. & G.	C	C		F			
Emilia sonchifolia (L.) DC.	I						
Erechtites hieracifolia (L.) Raf.	R			F			
Erigeron quercifolius Lam.	C			F			
Eupatorium capillifolium (Lam.) Small	C						
Eupatorium mikanioides Chapm.	F			F			
Flaveria floridana J. R. Johnston	F			C			
Flaveria linearis Lag.	F			C			
Gnaphalium purpureum L.	C						
Iva frutescens L.							I
Iva imbricata Walt.		C					
Melanthera deltoidea Michx.	C	I		F			
Mikania batatifolia DC.	F		C	F			
Pectis linearifolia Urban	F			F			
Pectis prostrata Cav.	I						
Pluchea purpurascens (Sw.) DC.				F			
Pluchea rosea Godfrey			F	F			
Solidago sempervirens L., var. mexicana (L.) Fern.	I	F	I				
Sonchus oleraceus L.	F						
Verbesina virginica L., var. laciniata A. Gray	C						

NON-VALIDITY OF NUTTALLIAN NAMES IN FRASER'S CATALOGUE

Lloyd H. Shinners

In 1890 Edward L. Greene reprinted in Pittonia (vol. 2, pp. 116–119) "A Catalogue of New and Interesting Plants Collected in Upper Louisiana, and principally on the River Missourie, North America, [by T. Nuttall,] for sale at Messrs. Fraser's Nursery For Curious American Plants, Sloane Square, King's Road, Chelsea, London," dated 1813. The reprint was made from a copy at the Philadelphia Academy, in which Nuttall had inserted his name after the first part of the title, indicated above by brackets. Under present rules of nomenclature, commercial catalogues and newspapers are not to be accepted as media for effective publication of scientific names after 1 January 1953, but the regulation is unfortunately not retroactive. Following Greene's resurrection of Fraser's Catalogue, a number of names from it have come into circulation, credited to Nuttall. But an examination of the listings in the Catalogue, Pursh's Flora Americae Septentrionalis (1814), and Nuttall's The Genera of North American Plants (1818), shows that Nuttall himself did not accept most of the names in the Catalogue, and could scarcely have been its author.

Of the 89 names in Fraser's Catalogue, 71 are starred as new: 69 species (one not named beyond genus), 2 varieties. In his Genera, Nuttall mentions only 32 of the new species and one of the new varieties. Three are credited to other sources than the Catalogue: *Allium stellatum* "Sims, Bot. Mag."; *Bartonia decapetala* "Bot. Mag." (listed as synonym of *B. ornata* Nuttall, the only species, the genus starred as new); *Oenothera macrocarpa* "PH." (i. e., Pursh; listed as synonym of *O. alata* n. sp. by Nuttall). Ten names are starred as new in the Genera, without mention of previous publication, though all had appeared in the Catalogue: *Calymenia pilosa*, *Cactus viviparus*, *C. ferox*, *C. fragilis*, *Cheiranthus asper* (spelled *asperus* in the Catalogue), *Elaeagnus argentea* (spelled *argenteus* in the Catalogue), *Gaura coccinea*, *Oenothera caespitosa*, *O. serrulata*, *Rudbeckia purpurea* var. *serotina*. Fourteen names appear in the Genera credited to "T. N. in Fras. Catal."; two are misquoted (*Glycyrrhiza*

lepidota, which in the Catalogue is *Liquiritia lepidota; Artemisia nutans*, as synonym of *A. cernua* n. sp., is *A. cernua* in the Catalogue); two (in addition to *Artemisia nutans*) are placed in synonymy (*Lactuca oblongifolia* under *L. integrifolia* n. sp., with *L. pulchella* Pursh as an additional synonym; *Seseli lucidum* under *S. divaricatum* Pursh); ten are accepted and starred as new though with reference to previous publication in the Catalogue (*Amorpha canescens, A. nana, Calymenia angustifolia, Dalea aurea, Lilium andinum, Malva coccinea, Phalangium esculentum, Psoralea esculenta, P. incana, Troximon glaucum*). Six more are credited in the Genera only to "Fras. Catal."; one is neither described nor starred as new (*Eriogonum flavum*), the remaining five are both (*Astragalus gracilis, Oenothera albicaulis, Penstemon grandiflorum, P. cristatum, P. erianthera*).

Eighteen new names appear in Fraser's Catalogue with some descriptive remarks. In addition there is a brief joint description for two species of *Sideranthus*. Only four are acknowledged by Nuttall to have been his: *Amorpha nana, Lilium andinum, Malva coccinea, Phalangium esculentum*. Two are credited by Nuttall only to "Fras. Catal.": *Eriogonum flavum* (not described in the Genera), *Penstemon grandiflorum*. One is credited to Pursh without reference to the Catalogue, though first described there: *Oenothera macrocarpa* (as synonym of *O. alata* n. sp.). Ten are not mentioned by Nuttall in his Genera: *Astragalus crassicarpus, Dalea enneandra, Hyssopus anethiodorus, Rudbeckia columnifera, Sideranthus integrifolius, S. pinnatifidus, Thuraria herbacea, Virgilia grandiflora, Vitis campestris, Yucca glauca*. The first, second, fourth, and tenth of these are in current use, attributed to Nuttall, though he quite plainly disclaimed them. Three more are described as new in 1818 without reference to the Catalogue: *Cactus viviparus, Oenothera caespitosa* (spelled *cespitosa* in the Catalogue), *Rudbeckia purpurea* var. *serotina*.

It must be concluded from this record that Nuttall was not the author of Fraser's Catalogue, and did not consider it an accepted medium for publication of new names. His autograph on the Philadelphia copy was intended to mean not "A Catalogue, by T. Nuttall, of Plants Collected in North America," but "A Catalogue of Plants, Collected in North America by

T. Nuttall." He evidently supplied manuscript names with some of the plants which he sent to the Frasers. References in his Genera to their Catalogue were an effort to salvage some (not all) of these names. He was resentful of Pursh's having anticipated him in publishing them, as some of his remarks indicate. Under *Amorpha canescens* he says, "Mr. Pursh places his *usual* mark of *v.v.* to this species, although he had never seen a flowering specimen except in my herbarium." In a footnote under *Bartonia ornata* he writes, "Mr. Pursh, before he had perused the notes which I had made from the living plant on the Missouri, with an intention of rendering them public, had not then, by his own acknowledgment, anything like materials for publishing this genus, . . . This unfortunate want of fidelity, prevented me from communicating to Mr. F. Pursh, many of the plants which now appear in this work. . . . It was surely not honorable in Frederick Pursh, whom I still esteem as an able botanist, to snatch from me the little imaginary credit due to enthusiastic researches made at the most imminent risk of personal safety!"

It would be unjust to accuse Pursh of totally unethical behavior. Nuttall was a shy and secretive man, and it is altogether likely that he did not confide to Pursh his plan to publish a North American flora when the German botanist visited him and examined his herbarium. Pursh must have guessed that at least some of the names in Fraser's Catalogue had originated with Nuttall, but he did not know which ones, nor did he know precisely Nuttall's intentions concerning them. Communication was slow and difficult, and Nuttall himself, in his frequent travels, not easily accessible.

But the fine etiquette of the matter, as seen at this late date, cannot be our basis for determining the validity of the names published in the Catalogue. These were anonymous as published. We do not know whether the Catalogue was prepared by one of the Frasers or by a clerk in their employ. Since the names were not avowedly accepted by any author, they were not validly published. (Cf. Jacques Rousseau, "One Plant Name in Search of an Author," Taxon 4: 40–42, 1955.) It might be argued that we must at least keep the names claimed later by Nuttall. We should then have to keep those not claimed by

him also. Nuttall himself did not retain all the names which he acknowledged to be his. We cannot very well allow that he could legitimize some parts of the Catalogue and not others. His inconsistent treatment gives us sufficient legal grounds, if anonymity be not enough, to disregard all names in the Catalogue.

Nor can it be held that usage gives any support to retention of the names. The inconsistencies of later authors are strikingly shown in the eighth edition of Gray's Manual. "*Yucca glauca* Nutt." was an anonymous name explicitly disclaimed by Nuttall, who does not mention it in his Genera, but lists *Y. angustifolia* Pursh. "*Psoralea esculenta* Pursh" first appeared in Fraser's Catalogue as a *nomen subnudum*, but unlike *Yucca glauca*, was claimed by Nuttall in 1818. The same is true of *Amorpha nana* (*A. microphylla* Pursh). "*Dalea enneandra* Nutt." is an identical case with that of *Yucca glauca;* Nuttall in 1818 called it *D. laxiflora* Pursh, and did not mention the binomial later erroneously attributed to him. *Astragalus caryocarpus* Ker is inconsistently (but correctly[1]) adopted in place of *A. crassicarpus*, another anonymous name never accepted by Nuttall. "*Glycyrrhiza lepidota* (Nutt.) Pursh should strictly be credited to Pursh alone: if dated from 1813, it may be considered a misprint corrected by Nuttall in 1818 from *Liquiritia* to *Glycyrrhiza*. "*Sphaeralcea coccinea* (Pursh) Rydb." is correct, but again inconsistent, since the basonym (*Malva coccinea*) first appeared in Fraser's Catalogue accompanied by a description, and was subsequently claimed by Nuttall as his. *Mamillaria vivipara* (Nutt.) Haw. has basonym dated from 1818, not 1813. "*Penstemon grandiflorus* Nutt." (credited by him only to Fraser's Catalogue, not to himself) must give way to *P. Bradburii* Pursh. *Ratibida columnifera* (Nutt.) Woot. & Standl. (basonym never acknowledged by Nuttall) returns to its long familiar name, *R. columnaris* (Pursh) Rafinesque.

[1] Correctly under then existing rules of nomenclature, which outlawed names based on mixtures. As since revised, Article 76 of the International Code requires the adoption of *A. carnosus* Pursh for this species: though based in large part on the later-named *Sophora sericea* Nutt., there is no doubt but that the name *carnosus* was intended to describe the fruit of *Astragalus caryocarpus* (also named later). Nuttall by implication, and Torrey & Gray explicitly, typified Pursh's epithet with the *Astragalus* element, for which it must now be revived.

THE ARCHER METHOD FOR MOUNTING HERBARIUM SPECIMENS

Reed C. Rollins

Since the publication by W. Andrew Archer[1] in 1950 of an article entitled, "New Plastic Aid in Mounting Herbarium Specimens", there has been an increasing interest in the use of plastic for this purpose. In presenting his formula five years ago, Dr. Archer invited prospective users to further improve it and to modify methods of procedure to suit particular needs. We have been using the Archer Method with some slight modifications at the Gray Herbarium with excellent results for several years. The frequent calls for information concerning our present formula and procedure have prompted me to put these into print for the convenience of those interested.

Original Archer Formula

Toluene—800 cc.
Methanol—200 cc.
Ethel cellulose (Dow Chemical Ethocel[2])
standard 7 cps.—250 grams.
Dow Resin 276 V-2—75 grams.

New York Botanical Garden Modified Formula

Toluene—720 cc.
Methanol—180 cc.
Ethocel—250 grams
Dow Resin—75 grams

Gray Herbarium Modified Formula

Toluene—880 cc.
Methanol—220 cc.
Ethocel, standard 10 cps.—1750 cc. (560–650 grams).
Dow Resin—75 grams

First mix methanol and toluene; then add and dissolve the resin completely. Finally mix in the ethocel adding it gradually. The resulting stiff coarse mixture should be stirred slowly until the ethocel is partly dissolved. There will be many bubbles

[1] Rhodora 52: 298–299. 1950.

[2] Ethocel and Dow Resin are obtainable from the Dow Chemical Company, Midland, Michigan. At present the Ethocel may not be purchased in less than 50 pound lots at a cost of about $40.00. The Dow Resin is sold in a 5 gallon container. This may seem expensive, but fifty pounds of Ethocel and five gallons of Dow Resin together with appropriate amounts of the solvents have provided the plastic for mounting over 40,000 specimens.

and large particles present at this stage, but the solution will clear in about 24 hours.

It will be quickly noted that the users at both New York and at Gray found the original formula less viscous than desirable. In the New York modification, less solvent is used, and the proportions of Toluene and Methanol are maintained. In working toward greater viscosity, my own procedure was to obtain Ethocel of standard 10 cps. (to replace standard 7 cps.) and to increase the proportion of ethel cellulose. The first combination that came close to meeting with satisfaction was based on the use of 1000 cc. of solvent. However, this proved to be difficult to use in the dispensers; hence, another 100 cc. of the solvent was added to the formula. It should be understood that the formula was arrived at by trial and error, and I feel sure that several different combinations of the basic materials originally put together for this purpose by Archer would be very satisfactory.

In a recent letter, Dr. Archer notes that the Gray Herbarium Formula, using 625 gms. of ethocel, has proven to be too thick for some dispensers. He is now using the following formula: toluene 880 cc.; methanol 220 cc.; ethocel (standard 10 cps.) 575 gms.; resin 75 gms. I feel sure that the use of a weight measure for the ethocel is at the base of the inconsistencies experienced by different persons in making up the formula. For example, the weight of 1750 cc. of one lot of ethocel was 659.7 gms., while the weight of 1750 cc. of another lot was 560.5 gms. It appears that volume measure is more reliable than weight measure. At least, we have always used and gotten consistent results with a volumetric measure in handling the ethocel. It may be necessary to make minor adjustments in the formula with each new lot of ethocel. However, I do not believe the proportions are at all critical and they may be shifted somewhat without materially devaluing the final product.

We find it possible to mount large woody materials, even pine cones, by use of the above formula. The viscosity is such that it will hold well on the sides of a branch or stem and not produce a weak point in the strand by thinning at the vertical part. Our aim is to put the plastic in a strap-like form over the stem or a portion of the leaf etc., in such a way as to have each end

of the plastic strap firmly anchored on the mounting sheet. On large leaves, holes are punched with a paper punch a centimeter or two from the edge at intervals around the leaf. The plastic strap is spread from the mounting paper to the hole through which it reaches the paper beneath the leaf. Thus, a large leaf can be as firmly strapped to the mounting sheet as can stems and other parts of the plant. This procedure essentially eliminates the need or the desirability of smearing the specimen with plastic on the side placed downward on the mounting sheet. The mounting job, then, is essentially one of strapping the specimen to the sheet with plastic straps squirted from a pressure oil can. Occasionally on especially bulky materials or where a specimen will not lie flat, plastic is used beneath the projecting part of the specimen to provide a kind of seat upon the paper. It is important to have a strap stretch from paper at one end to paper at the other. The bonding of the plastic with the specimen itself is often imperfect and cannot be relied upon to hold. This is not true with the plastic to paper bonding which is exceptionally strong.

Some users of plastic as a mounting medium have experienced difficulty from having stacked the sheets before the plastic was fully dry. The sheets stuck together and produced real difficulty. Actually, the plastic dries quite rapidly, and the sheets can usually be safely stacked in about 40 minutes to an hour. Also, some users require a large amount of table space for their mounting operation because the specimens are laid out on the sheets side by side on tables. After a group of specimens are laid out and weights put into position, the mounter applies the plastic. While these are drying, a second group of specimens is laid out, etc. When the first group is dry, the sheets of specimens are then stacked. We have eliminated the need for a large amount of table space and made the time factor in drying unimportant by two simple procedures. Furthermore, the mounter is permitted to sit down while working.

The sheet of mounting paper is placed upon a double-faced corrugated cardboard slightly larger in size than the sheet. The label is affixed to the sheet; the specimen is placed and weighted;[3] and finally the plastic is applied. The mounter

[3] For weights, we have found broken up type-plates to be ideal. These lead sheets

then puts four small wooden blocks or, other objects of similar nature, on the cardboard near the four corners. The cardboard carrying the mounted specimen with the plastic still wet is then stacked. Each successive cardboard in the stack is held above the wet plastic of the sheet below, and the stack may be left until the plastic is dry without inconvenience. The wooden blocks are of two or three lengths so that four blocks as much as an inch long may be selected if the thickness of the specimens requires it. The cardboards are easily obtained from paper box manufacturers. For us, the double-faced corrugates commonly used in plant presses serve very well.

Dispensing the plastic provides no great problem. We find the "pistol grip" pressure oil can of the type used for spraying the springs of automobiles very satisfactory. This type of dispenser, called to my attention by Dr. David D. Keck, can be used continuously for several months without cleaning. At first, we were careful to cover the end of the spout while not in use, thinking the plastic would harden in it. However, this proved to be an unnecessary precaution, for the plastic seals the end of the spout very quickly; and the short plug formed is easily squeezed out even after several days have elapsed. If the plastic hardens in the spout, the nozzle can be soaked in the solvent. The spout of the dispenser is made of brass, and the copper present reacts with the plastic to make the plastic greenish in color. If the dispenser has not been used for several days, the plastic in the spout will be quite colored. For those who find this objectionable, it is a small waste to squeeze that amount away before starting the mounting of specimens. The barrel of the dispenser should not be brass, for the whole of the contents will then become colored. Whenever the dispenser becomes fouled after long usage, it can be cleaned by disassembling it and submerging the parts in the solvent for several days.

Our mounters find it worthwhile to wipe the end of the spout of the dispenser frequently to keep the flow of plastic smooth. This produces a neater strap and prevents unnecessary threading of the plastic itself. In fact, they find it convenient to work

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can be readily broken into many different sizes. Of course, any relatively heavy bits of metal will do very well.

with the dispenser in one hand and a small cloth in the other wiping the nozzle after every few straps extruded.

The plastic once made up appears to have excellent keeping qualities if kept in an airtight container. Once dried after use in mounting, it is tough and durable and not easily broken even by a direct hit with a metal object.[4] There is some contraction of the plastic on drying, and this tends to pull the specimen tight against the paper giving the full value of support to the specimen that the paper can provide. The fact that the plastic does contract makes it inadvisable to use long straps, especially if several are put parallel to one another. Several long parallel straps will contract enough to pull the mounting paper into wrinkles. We use straps mostly below an inch in length although occasional longer ones are required and can be safely used. The first tendency of the mounter in using the plastic is to put long straps over several culms of grass or similar specimens. This should be avoided not only because it tends to form wrinkles in the sheet, but also produces unsightly mounted specimens as well. While the strap should be kept relatively short, its thickness may be increased by passing the stream of plastic back and forth several times.

Some feel it is too early to evaluate completely the Archer Method from the point of view of what may happen to the plastic straps after forty or fifty years in the herbarium. However, if the plastic holds after five years, it seems to me that it might be expected to hold indefinitely. One thing we do know is that the plastic does not appear to become brittle with the passage of time. And there are apparently no *a priori* grounds upon which to predict any appreciable change in the chemical or the physical nature of the plastic straps unless they are subjected to a powerful solvent. The latter seems highly unlikely in a well kept herbarium.

The chief advantage of the Archer Method is the speed-up possible in the mounting. In rough calculations, we have found that a mounter can prepare and mount three or four specimens using this technique in the time required to mount one specimen

[4] Paradichlorobenzene has been reported to soften the plastic even after it has dried thoroughly. Our own tests with a high concentration of p d b at room temperature did not produce any noticeable affect. However, no tests were made under varying conditions of temperature and moisture.

using paste and gummed cloth strips. Where heavy specimens are sewed, the time saved is even greater, for sewing is not required. A second advantage comes from the possibility of repairing specimens in the herbarium itself. A dispenser filled with plastic can be kept handy for remounting loose specimens or broken parts by the botanist while he is actually working in the herbarium. This eliminates the necessity of having the specimen out of the herbarium in the hands of the mounter and of having to refile it in the herbarium at a later time. Personally, I believe the use of plastic makes a better looking mounted specimen. However, all botanists may not agree on this point.—GRAY HERBARIUM OF HARVARD UNIVERSITY.

PINUS RIGIDA MILLER IN QUEBEC.—Owing to the lack of authentic records, the presence of *Pinus rigida* Miller in the province of Quebec had always been in doubt. During a field trip in the region of Saint-Chrysostôme, Chateauguay County, made on September 4th, 1954, Mr. Lionel Cinq-Mars and the author have found a natural stand of *Pinus rigida* at Cairnside. The mixed stand covers an area of about a square mile. The trees growing in the forest attain around thirty-five feet in height and about eight inches in diameter. When they grow on the bare Potsdam sandstones, they are stunted and the lower branches are heavily covered with cones. *Pinus resinosa* Ait. and *Pinus Strobus* L. are also present in the area.—ERNEST ROULEAU, HERBIER MARIE-VICTORIN, UNIVERSITÉ DE MONTRÉAL.

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